Find Equivalent Forms of Rational Numbers

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CONCEPT 1

Find Equivalent Forms of Rational Numbers

Here you'll find equivalent forms of rational numbers.

Kelly and Mallory are comparing the number of boxes of erasers that each one of them has sold. Kelly works in the store one day and Mallory works in the store the next day. They decide to write a riddle about their sales and give it to Trevor to figure out. When Trevor comes in the store on the day after Mallory has worked he finds this riddle.

Mallory sold 4 more boxes of erasers than the three-fourths that Kelly sold. If Mallory sold 13 boxes, how many boxes did Kelly sell?

Trevor is puzzled. He knows that there has to be a variable because the number of boxes that Kelly sold is unknown. He also knows that he needs to write an equation and that this equation will have a rational number, three-fourths in it.

He starts to work.

Using rational numbers is a skill that you will need as you approach higher levels of mathematics. To solve this problem, you will need to understand rational numbers. At the end of this Concept, you can help Trevor with this problem.

Guidance

You have learned about different kinds of numbers. You have learned about decimals, fractions, integers and whole numbers, now we are going to investigate rational numbers.

What is a rational number?

A *rational number* is a number that can be written in fraction form.

That is a good question. It means that the number can be written as a fraction, not that it necessarily is a fraction right away.

We can think of fractions first. A fraction is a rational number because it is written in fraction form. Rational numbers can also be positive or negative. Think about if you had lost one-half. Then the number would be negative.

$$\frac{-1}{2} \text{ and } \frac{1}{2}$$

Both of these are rational numbers.

What other numbers can be written in fraction form and are therefore rational numbers?

Well, you can think of integers. Remember that an integer is the set of whole numbers and their opposites. We can write any integer as a fraction over 1. This makes all integers rational numbers.

$$-4 = \frac{-4}{1}$$
$$13 = \frac{13}{1}$$

These integers are rational numbers too.

What about decimals?

A decimal is related to a fraction. Most decimals can be written as fractions. When you understand how to convert a decimal to a fraction and a fraction to a decimal, you will be able to determine whether or not the decimal is a rational number.

Is .34 a rational number?

If you look at this decimal, what is the value of it? It is 34 hundredths. We can write this decimal as a fraction with a denominator of 100.

$.34 = \frac{34}{100}$

This is a rational number. Regular decimals are also rational numbers.

Here is another one.

Is .3434343434 a rational number?

This is a tricky one because we have a *repeating decimal.* However, because it has an end to it, we can find its fraction equivalent. All repeating decimals are also rational numbers.

Which decimals are not rational numbers?

Decimals that do not have an end are not rational numbers. We can think of an irrational number in this way. An example of an irrational number is pi. We say pi is equal to 3.14, but really it goes on and on and on.

Pi or 3.14... . These values are not rational numbers.

Examples of rational numbers

1. Fractions – both positive and negative

2. Decimals- positive, negative, terminating or repeating too.

3. Integers

Take a few minutes and write these down in your notebook.

We can also convert rational numbers into different forms.

What decimal is equivalent to the fraction $\frac{7}{8}$?

Divide to find the equivalent decimal.

$7 \div 8 = 0.875$

The decimal 0.875 is equivalent to $\frac{7}{8}$.

To convert from a decimal to a fraction, place the numbers in the decimal over the appropriate place value. For example, to convert 0.875 back to a fraction, count the decimal places. There are three decimal places, so there will be three zeros in the denominator.

$0.875 = \frac{875}{1000}$

Now simplify the fraction to lowest terms.

$\frac{875}{1000} = \frac{175}{200} = \frac{35}{40} = \frac{7}{8}$

What fraction is equivalent to the decimal 0.3125?

Place the numbers in the decimal over the appropriate place value. Count the decimal places. There are four decimal places, so there will be four zeros in the denominator.

$0.3125 = \frac{3125}{10000}$

Now simplify the fraction to lowest terms.

$\frac{3125}{10000} = \frac{125}{400} = \frac{5}{16}$

The fraction $\frac{5}{16}$ is equivalent to 0.3125.

That is a great question. Because a percent also represents a part of a whole, percents can also be rational numbers. We can convert a percent to a decimal and to a fraction too. Remember that a *percent* means out of 100.

What is 30% as a fraction? As a decimal?

We can start by knowing that 30% means 30 out of 100. Now we can write it as a fraction and as a decimal.

$30\% = \frac{30}{100} = .30$

Percents that have been converted to decimals and fractions can also be considered rational numbers.

Convert each to a percent or a fraction.

Example A

.67

Solution: 67%

Example B

45%

Solution: $\frac{45}{100} = \frac{9}{20}$

Example C

.185

Solution: 18.5%

Now let's go back to the dilemma from the beginning of the Concept.

First, you need to write an equation. Here is how each part of the equation breaks down.

$x =$**Kelly's boxes**

$+4 =$**the four more boxes that Mallory sold**

$\frac{3}{4} =$**three-fourths of Kelly's boxes**

$13 =$**the number that Mallory sold**

Here is the equation.

$\frac{3}{4}x + 4 = 13$

Next, we can solve it.

Start by subtracting four from both sides. This makes perfect sense in simplifying.

$\frac{3}{4}x = 9$

Next, we want to get the variable alone, so we can multiply by the reciprocal. This is the Inverse Property of Multiplication. Any number multiplied by its inverse or reciprocal is equal to 1.

$$\frac{4}{3} \cdot \frac{3}{4}x = 9 \cdot \frac{4}{3}$$
$$x = \frac{36}{3} = 12$$

Now we know that Kelly sold 12 boxes and Mallory sold 13 boxes.

Vocabulary

Rational Number
number that can be written in fraction form.

Integer
the set of whole numbers and their opposites.

Percent
number representing a part out of 100.

Terminating Decimal
a decimal that has an ending even though many digits may be present.

Repeating Decimal
a decimal that has an ending even though many digits may repeat.

Irrational Number
a decimal that has no ending, pi or 3.14... is an example.

Guided Practice

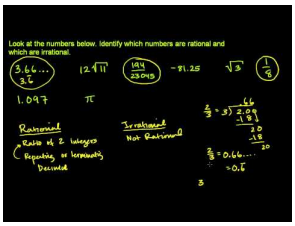
Here is one for you to try on your own.

Is .35678921 a rational number?

Solution

This is not a repeating decimal, but it is a terminating decimal. A *terminating decimal* has an end to it. As long as it has an end, it is a rational number.

Video Review



MEDIA

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KhanAcademyIdentifyingRational Numbers

Practice

Directions: Identify whether each is a rational number or not. Write yes or no for your answer. Then identify the form of the number: integer, decimal, repeating decimal, fraction, terminating decimal, irrational number

1. .456
2. $\frac{2}{3}$
3. -45
4. 567
5. $-8,970$
6. .3434343434
7. .234...
8. .234567
9. $-.876$
10. $-\frac{2}{7}$

Directions: Write each rational number as a decimal and a percent.

11. $\frac{4}{5}$
12. $\frac{1}{5}$
13. $\frac{14}{50}$
14. $\frac{12}{100}$
15. $\frac{6}{25}$